What is claimed is:

1. A nucleic acid molecule, wherein said nucleic acid molecule encodes a polypeptide comprising SEQ ID NO:2.

2. The nucleic acid molecule of claim 1, wherein said nucleic acid comprises the nucleic acid sequence of nucleotides 115-1,830 of SEQ ID NO:1.

3. A nucleic acid molecule encoding an osteoactivin protein, wherein said nucleic acid hybridizes to the complement of nucleotides 115-1,830 of SEQ ID NO:1 under moderately stringent conditions.

4. A nucleic acid molecule encoding an osteoactivin protein, wherein said nucleic acid molecule has at least 92% sequence identity with the nucleic acid sequence of nucleotides 115-1,830 of SEQ ID NO:1.

5. A nucleic acid molecule, wherein said nucleic acid molecule encodes a polypeptide comprising amino acids 23-572 of SEQ ID NO: 2.

6. An isolated and substantially pure osteoactivin protein, wherein said osteoactivin protein comprises the amino acid sequence of SEQ ID NO:2.

7. An isolated and substantially pure osteoactivin protein having at least 90% sequence identity with the amino acid sequence of SEQ ID NO:2, wherein said osteoactivin protein or polypeptide fragment thereof stimulates bone cell differentiation.

8. An isolated and substantially pure osteoactivin protein, wherein said osteoactivin protein comprises amino acids 23-572 of SEQ ID NO:2.

9. A biologically functional expression vector comprising a nucleic acid sequence encoding an osteoactivin protein, wherein said osteoactivin protein:

(a) comprises the amino acid sequence of SEQ ID NO:2; or

(b) comprises amino acids 23-572 of SEQ ID NO:2.

10. A biologically functional expression vector comprising the nucleic acid molecule of claim 3 or 4, and wherein said nucleic acid molecule encodes a polypeptide that stimulates bone cell differentiation.

11. A substantially pure antibody that specifically binds to one or more epitopes of an osteoactivin protein, or a polypeptide fragment thereof, wherein said antibody binds to one or more epitopes of an osteoactivin peptide comprising amino acids 538-553 of SEQ ID NO:6.

12. A substantially pure antibody that specifically binds to one or more epitopes of an osteoactivin protein, or polypeptide fragment thereof, wherein said antibody binds to one or more epitopes of an osteoactivin peptide comprising SEQ ID NO:2.

13. The antibody of claim 12, wherein said antibody is selected from the group consisting of an antibody which binds to one or more epitopes of an osteoactivin peptide 35 having SEQ ID NO:3 and an antibody which binds to one or more epitopes of an osteoactivin peptide 551 having SEQ ID NO:4.

14. A method for producing a substantially pure osteoactivin protein, or polypeptide fragment thereof, comprising:

a. culturing a cell stably transformed with the nucleic acid molecule of claim 1, 2, or 5 encoding an osteoactivin protein; and

b. isolating and purifying said osteoactivin protein from said culture medium.

15. A method for producing a substantially pure osteoactivin protein, or polypeptide fragment thereof, comprising:

a. culturing a cell stably transformed with the nucleic acid molecule of claim 3 or 4 encoding an osteoactivin protein; and

b. isolating and purifying said osteoactivin protein from said culture medium.

16. A therapeutic composition comprising a nucleic acid molecule encoding an osteoactivin protein, or biologically active polypeptide fragment thereof, wherein said osteoactivin protein stimulates bone differentiation.

17. The therapeutic composition of claim 16, wherein said nucleic acid molecule encodes a human osteoactivin protein.

18. The therapeutic composition of claim 17, wherein said nucleic acid molecule encodes the amino acid sequence of SEQ ID NO:6.

19. The therapeutic composition of claim 17, wherein said nucleic acid molecule encodes amino acids 23-560 of SEQ ID NO:6.

20. A therapeutic composition comprising an agent that stimulates osteoactivin-mediated bone differentiation.

21. A therapeutic composition comprising an osteoactivin protein, wherein said osteoactivin protein stimulates bone cell differentiation.

22. The therapeutic composition of claim 21, wherein said osteoactivin protein is human.

23. The therapeutic composition of claim 22, wherein said osteoactivin protein comprises SEQ ID NO:6.

24. The therapeutic composition of claim 22, wherein said osteoactivin protein comprises amino acids 23-560 of SEQ ID NO:6.

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25. A therapeutic composition comprising the antibody of claim 11 or 12.

26. A therapeutic composition comprising an agent that inhibits osteoactivin-mediated bone differentiation.

27. A method for stimulating bone formation in a mammal, comprising administering to said mammal a therapeutically effective amount of the therapeutic composition of claim 16, 20, or 21.

28. The method of claim 27, wherein said mammal is human and wherein said human is administered the therapeutic composition of claim 17.

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29. The method of claim 27, wherein said mammal is human and wherein said human is administered the therapeutic composition of claim 20 or 22.

30. The method of claim 27, wherein said therapeutic composition is administered to treat a bone disorder.

31. The method of claim 30, wherein said disorder is osteoporosis or periodontal disease.

Sub B5

32. A method for inhibiting bone formation in a mammal, comprising administering to said mammal a therapeutically effective amount of the therapeutic composition of claim 25 or 26.

33. The method of claim 32, wherein said therapeutic composition is administered to treat ectopic bone formation or osteopetrosis.

34. A method for identifying an agent that modulates bone formation, comprising:

a. culturing separate samples of cells in the presence and absence of said agent in a suitable culture medium, wherein said cells express a gene under the control of an osteoactivin regulatory element; and

b. measuring and comparing the levels of expression of said gene in said samples of cells cultured in the presence and absence of said agent, wherein a difference between expression levels in the presence of the agent and in the absence of the agent is indicative that the agent modulates bone formation.

35. The method of claim 34, wherein said cells express an endogenous osteoactivin gene under the control of said regulatory element.

36. The method of claim 34, wherein said cells express a reporter gene under the control of said regulatory element.

37. The method of claim 34, wherein said osteoactivin regulatory element is human.

38. A method for diagnosing osteopetrosis in a mammal, comprising:

a. measuring the level of osteoactivin expression in said mammal; and

b. comparing said level of osteoactivin expression to a level of osteoactivin expression in a control mammal not suffering from osteopetrosis,

wherein increased expression in (a) compared to (b) is indicative of osteopetrosis in the mammal in (a).

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